



Overview of REC Markets and Pricing

Workshop on REC Markets and Challenges

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Evolution Markets Overview

- ❑ Evolution Markets was founded in 2000
- ❑ Offices in New York – San Francisco – London – Calgary
- ❑ World's Largest Environmental Brokerage
 - More than 60 Brokers Worldwide
- ❑ More than \$50 billion in energy and environmental transactions

The Markets We Serve

□ Environmental Markets

- Renewable Energy Credits
- GHG Credits/Allowances
- SO₂ Emissions Allowances
- NO_x Emissions Allowances
- Emissions Reduction Credits
- Houston/Galveston NO_x Allowances
- RECLAIM (LA NO_x and SO_x)
- Weather Derivatives

□ Energy Markets

- OTC Physical Coal
- OTC Coal Derivatives
- Green Power
- Natural Gas
- Nuclear Fuels
- Biofuels

Evolution Markets Commitment to Renewable Markets

- ❑ RECs brokerage since 2002
- ❑ REC brokerage, green power contracts, financial services
- ❑ Compliance RECs (Northeast/Texas) from New York
- ❑ Voluntary RECs (Nationwide) and Western Compliance RECs from San Francisco
- ❑ Market's only Green-e approved broker
- ❑ Market's most honored brokerage



Environmental Finance Magazine Customer Survey
Best Broker, US Renewables (2006, 2005, 2004, 2003)



Energy Business

Silver Award Winner 2005

Renewable Energy

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Evolution Markets: REC Market Pioneer

- First RECs brokered in: Texas, Massachusetts, Connecticut, Maryland, District of Columbia, California
- First Green-e certified broker
- Conducted seven REC auctions for Mass. Technology Collaborative
- Evolution Markets participates in regulatory process in Texas, Massachusetts, and has a representative on the WREGIS Board
- Evolution Markets is a leader in market transparency

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Monthly Market Update

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RECs 101

- Why RECs?
- What are RECs?
- RECs Terminology

RECs 101: What are RECs?

- ❑ RECs represent the environmental, social, and other benefits of renewable energy generation
- ❑ 1MWH = 1 REC (Unless otherwise stated)
- ❑ By acknowledging a second commodity (in addition to the electricity itself) a product is created that can be purchased and sold without the same constraints of the power market
- ❑ In theory (if not always in practice) the additional revenue from REC sales gets renewable energy projects built

RECs 101: RECs Terminology

“Renewable Energy
Credits” (RECs)

“Renewable Energy
Certificates” (RECs)

“Green Tags”

“Tradable Renewable
Certificates” (TRCs)

“Renewable Energy
Attributes”

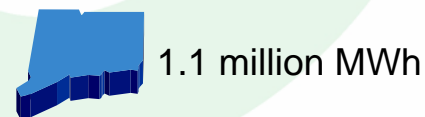
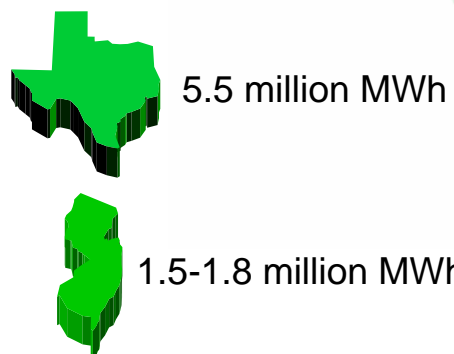
...they're all the same thing!

Transactions 101



Compliance Markets: Basics

- ❑ **Created by Renewable Portfolio Standards (RPS)**
- ❑ The most salient feature of the compliance markets is that they differ considerably from state to state → prices differ.
- ❑ Compliance buyers are generally indifferent to the type of resource that created the REC (insofar as it qualifies), but they are limited to a specific geographic region from where the REC can be sourced.
- ❑ Approximate total volumes required in the compliance markets in 2007 are as follows:



Compliance Markets: Pricing

- ❑ RPS vary, so do the markets they create...
- ❑ The impact of an RPS is a function of supply (eligible resources) and demand (percentage requirements), enforced by penalties...
 - Maine: 30% requirement, but 50% of supply qualifies → price ~\$0.30
 - Massachusetts: 3.0% requirement ('07), but limited resources qualify, and \$53 “alternative compliance payment” → prices \$50+

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Compliance RECs Market Prices on 09/06/07:

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Connecticut Class I REC prices on 09/06/07

term	bid price (change)		offer price (change)		last price (change)		date	actions		
2007-2007	\$50.00	n/c	\$54.00	n/c	\$52.00	n/c	5/17/07			

Massachusetts New REC prices on 09/06/07

term	bid price (change)		offer price (change)		last price (change)		date	actions		
Cal'07	\$51.50	n/c	\$56.00	n/c	\$54.75	n/c	8/17/2007			

Maryland Class I prices on 09/06/07

term	bid price (change)		offer price (change)		last price (change)		date	actions		
2006-2006			\$1.75	n/c	\$0.80	n/c	4/23/2007			
2007-2007	\$0.50	n/c	\$1.75	n/c	\$0.95	n/c	6/29/2007			

Maine REC prices on 09/06/07

term	bid price (change)		offer price (change)		last price (change)		date	actions		
2006-2006	\$0.10	n/c	\$0.40	n/c	\$0.20	n/c	2/26/2007			
2007-2007			\$0.25	n/c	\$0.20	n/c	2/26/2007			

Pennsylvania Tier 1 REC prices on 09/06/07

term	bid price (change)		offer price (change)		last price (change)		date	actions		
2005-2006			\$6.00	n/c	\$5.00	n/c	8/23/2007			

Texas REC prices on 09/06/07

term	bid price (change)		offer price (change)		last price (change)		date	actions		
2006-2006	\$2.25	n/c	\$3.25	-0.25	\$2.50	-0.50	6/11/2007			
2007-2007	\$3.00	+0.50	\$3.75	-0.50	\$3.40	+0.15	8/3/2007			

Voluntary Market: Basics

- ❑ **Driven by environmental disclosure, consumer demand, corporate commitments, carbon claims**
- ❑ **Voluntary Market Pricing**
- ❑ **Buyers Interested in Technology – Not Location**
- ❑ **Voluntary Market Volume**
 - In 2005, total sales in the voluntary markets were approximately 8.5 million MWh (Bird, L. and B. Swezey, 2006. *Green Power Marketing in the United States: A Status Report (Ninth Edition)*, NREL/TP-620-40904. Golden, CO: National Renewable Energy Laboratory, November.)
 - Roughly 970 MW of around-the-clock generation.

Voluntary Market: Pricing

price discretion based
on resource type:

Solar: \$10 - \$20



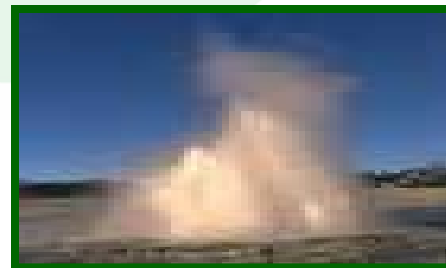
Biomass/Low-impact Hydro: \$1 - \$3

Wind: \$0.75 - \$15



Landfill Gas: \$1 - \$3

Geothermal: \$1-\$10



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Voluntary Renewables Market Prices:

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The following are indicative offers of Tradable Renewable Certificates (TRCs) and do not constitute a binding offer to sell. Some of these TRCs may be eligible for inclusion in Green-e certified products. [Click here to learn more about Evolution Markets' Green-e certified TRC products.](#)

category	region	state	generation	MWh	year	b/s	price
Limit to... ▾	Limit to... ▾	... ▾	Limit to... ▾	... ▾	Limit to... ▾	... ▾	-
New TRC	MAPP		wind	40,000	2009 - 2010	Sell	\$5.25
Existing TRC	WECC		small hydro	20,000	2005 - 2010	Sell	\$7.00
New TRC	WECC		geothermal	40,000	2005-2007	Buy	\$7.00
New TRC	WECC	CA	landfill	40,000	2006	Sell	\$5.00
New TRC	WECC		wind	30,000	2005	Sell	\$4.00
New TRC	WECC		wind	20,000	2005	Sell	\$1.00
New TRC	ECAR		wind	1,500	2005	Buy	\$15.00
New TRC	SPP		wind	50,000	2005-2007	Sell	\$1.95
New TRC	WECC	CA	solar	1,500	2005	Sell	\$25.00
New TRC	WECC	CO	wind	5,000	2006	Sell	\$10.00
New TRC	WECC	CO	wind	10,000	2006	Buy	\$3.50
New TRC	WECC	CA	wind	50,000	2006	Sell	\$2.75
Existing TRC	New York		small hydro	10,000	2005-2007	Sell	\$3.00
New TRC	ECAR		biomass	20,000	2005 - 2010	Sell	\$3.50
New TRC	South East		landfill	15,000	2005 - 2008	Sell	\$2.00
Existing TRC	New York	NY	small hydro	25,000	2005	Sell	\$4.00
New TRC	WECC	CA	landfill	40,000	2005	Sell	\$2.00

Transactions 101: How do RECs Trade?

- ❑ One REC represents the attributes associated with one megawatt hour (MWh) of energy from a renewable source.
- ❑ RECs are assigned a “vintage” based on the year in which they were generated.
- ❑ RECs are quoted by resource type and/or the market eligibility.
- ❑ Examples:
 - “5,000 vintage RY 2006 New Jersey Class 1 RECs”
 - “10,000 Cal 2007 Green E Wind RECs”

How RECs Trade: Compliance Markets

- ❑ Transfer through NEPOOL GIS, PJM GATS, TX GIS, WREGIS systems
- ❑ MRETS soon to follow
- ❑ Transaction Terms
 - All deals are subject to contract and credit
 - Typically delivery of RECs and then payment
 - Unrated entities prepay or post in full in escrow
 - Firm vs Unit Contingent

How RECs Trade: Voluntary Market

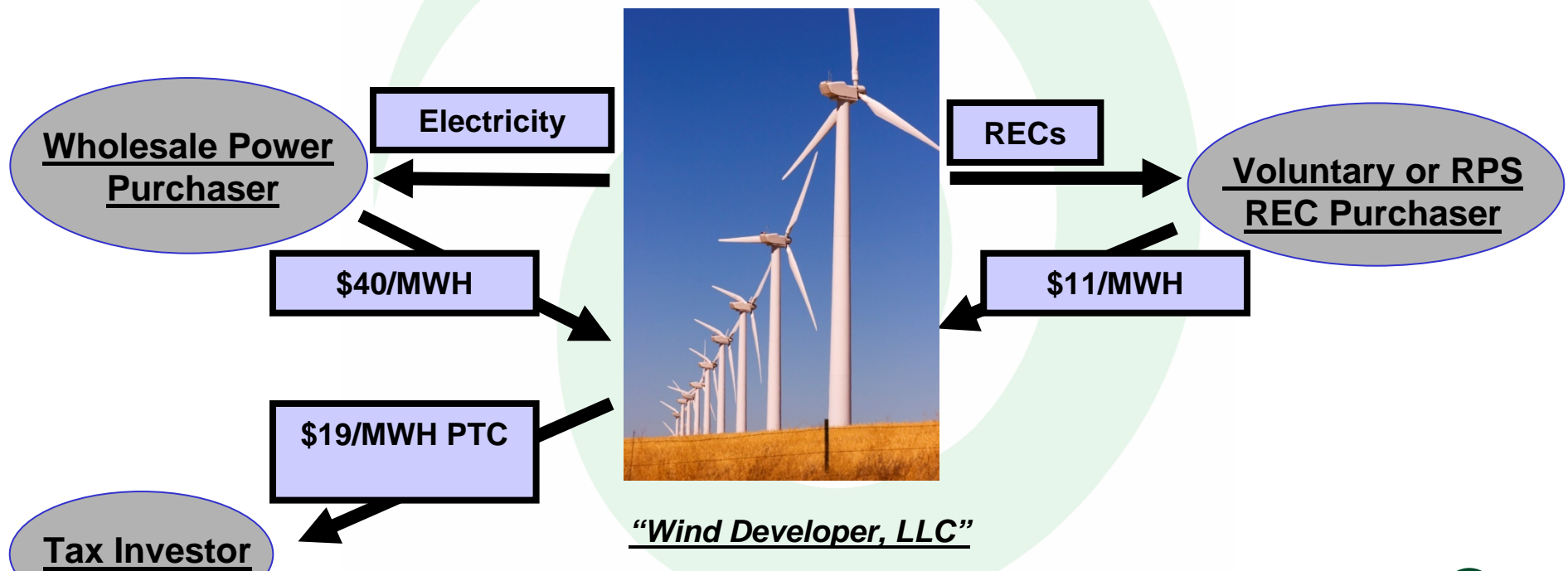
- ❑ Transactions typically done under Green-E standard
- ❑ Delivery of RECs through Attestation Form
- ❑ Transaction Terms
 - REC delivery either quarterly, semi-annually or annually
 - Payment is typically net 30 days of delivery



Financing Using RECs

Financing Renewables using RECs:

Example - \$70/MWH required to attract financing:



No transmission required for the REC sale

The Electricity buyer has no claim to Renewable Energy

Financing Renewables using RECs

- ☐ Regulatory Certainty
- ☐ Forward Curve
- ☐ Market Correlation

Financing Renewables using RECs

- ❑ More and more merchant projects are being developed
- ❑ RFP's for Bundled Green Energy deals becoming more commonplace
- ❑ 10-20yr Bundled PPA's are very common
- ❑ 3, 5 and 10yr REC only deals allow developers to maximize revenue streams

Federal RPS

- ❑ **House** approved RPS Amendment to Energy Bill (Aug. 6)
 - 15% from renewables by 2020
 - IOUs (not munis, co-ops, or federal power)
 - Renewable Energy = wind, solar, biomass, landfill gas, small hydro, other sources
- ❑ **Senate** tabled Sen. Bingaman's RPS Amendment to Energy Bill (June 22)
 - 15% from renewables by 2020
 - 25% of this mandate from energy efficiency
 - Renewable Energy = wind, solar, geothermal, ocean, biomass, landfill gas
- ❑ Senate to debate the Energy Bill (w/ House RPS Amendment) this Fall
- ❑ Bush Veto?

Carbon vs RECs

- ❑ Due to the lack of a compliance carbon market being in effect the jury is still out
- ❑ Voluntary RECs vs Carbon — At this point it is one or the other
 - To get voluntary carbon you must prove additonality
 - Exceptions Apply – LFG (REC for electricity – VER for the capture and destruction of methane)

Voted Top Renewables Broker – North America

2003-2006 *Environmental Finance* Customer Survey

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